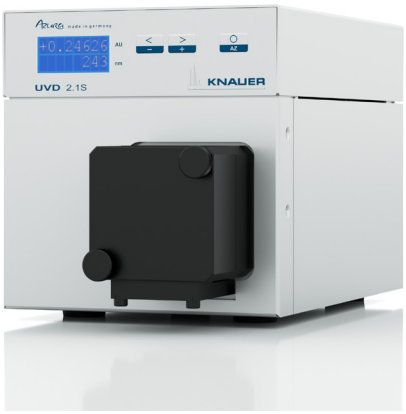
KNAUER

AZURA

Detector UVD 2.1S
User Manual

V6820



HPLC

Note: The contents of this user manual apply for the BlueShadow product. Please submit a request on any article numbers for BlueShadow.

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Intended Use

Note: **Only use the device for applications that fall within the range of the intended use. Otherwise, the protective and safety equipment of the device could fail.**

Device Overview

The detector is a measuring device that is used for measuring UV spectra quickly and precisely.

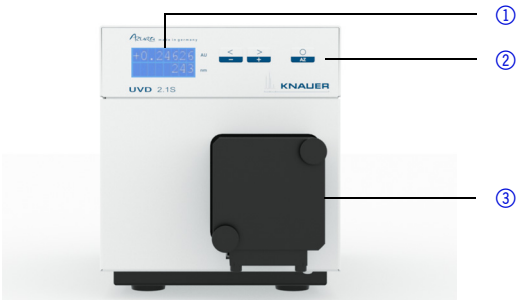


Fig. 1 Detector UVD 2.1S front view

Legend

① Display
② Keyboard
③ Flow cell

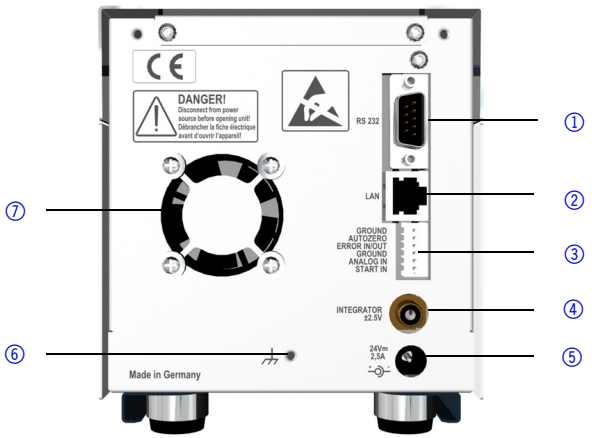


Fig. 2 Detector UVD 2.1S rear view

Legend	
① RS-232 port	④ Integrator Output
② LAN port	⑤ Connection
③ Pin header	⑥ Ground
	⑦ Fan

Operating range

The detector can be used in analytical and preparative HPLC system. It is used in laboratories to analyze substance mixtures. In a HPLC system, the detector serves to detect substances in liquids and show their concentration.

The device can be used in the following areas:

- Biochemistry analysis
- Chemical analysis
- Food analysis
- Pharmaceutical analysis
- Environmental analysis

The detector is, e. g., used at universities, research institutions, and routine laboratories.

Features

- One of the smallest HPLC detectors on the market.
- The deuterium lamp measures spectra between 190 nm to 500 nm.
- A wide range of flow cells for analytical or preparative LC applications with flow rates from 10 µl/min up to 10 l/min.
- Automatic recognition and storage of device-specific information, which are important for Good Laboratory Practice, Operation Qualifications (OQ), for repairing the device.
- Automatic and current diagnosis of the device
- Control with chromatography software or with the front panel.
- Easy integration of the detector into complex chromatography systems

Options

Various types of flow cells are available to the user. Pay attention to the compatability of the flow cells (see “Accessories and Spare Parts” on page 38).

Note: **A test cell is preassembled to the device. Before the detector can be used for measurements the test cell has to be replaced by a flow cell. The UVD 2.1S Fiber Optics Version is delivered without a test cell.**

Eluents

Even small quantities of other substances, such as additives, modifiers, or salts can influence the durability of the materials.

The list of selected solvents was compiled based on research in the pertinent literature and is only a recommendation. If there is any doubt, contact the Technical Support of the manufacturer.

Not suitable eluents
▪ Halogenated hydrocarbons, e.g. Freon®
▪ Concentrated mineral and organic acids
▪ Concentrated bases
▪ Eluents containing particles
▪ Perfluorinated eluents, e. g. Fluorinert® FC-75, FC-40
▪ Perfluorinated polyether, e.g. Fomblin®

Less suitable eluents
▪ Dimethyl sulfoxide (DMSO)
▪ Slightly volatile eluents
▪ Methylene chloride
▪ Tetrahydrofuran (THF)
▪ Dilute phosphoric acid

Suitable eluents
▪ Acetone at 4°-25° C (39.2°-77.0° F)[a]
▪ Acetonitrile
▪ Benzene
▪ Chloroform
▪ Ethyl acetate
▪ Ethanol
▪ Hexane/heptane at 4°-25° C (39.2°-77.0° F)
▪ Isopropanol
▪ Carbon dioxide (liquid 99.999% CO_2)
▪ Methanol

a. valid for the specified temperature range

Suitable eluents
▪ Phosphate buffer solutions (0.5 M) ▪ Toluol ▪ Dilute ammonia solution ▪ Dilute acetic acid (10-50%), at 25° C/77.0° F ▪ Dilute sodium hydroxide (1M) ▪ Water

Scope of Delivery

Note: Only use original parts and accessories made by KNAUER or a company authorized by KNAUER.

Detector with test cell[a]
Power cord
Power unit
Accessory Kit UVD 2.1S
Accessory Kit AZURA
User Manual (EN/DE)
Installation Qualification Documents (EN/DE)
Transport securing device (standard detector only)

a. Test cell not supplied with Fiber Optics Version

Safety for Users

Professional group

The user manual is addressed to persons that are qualified as chemical laboratory technicians or have completed comparable vocational training.

The following knowledge is required:

- Basic knowledge of liquid chromatography
- Knowledge regarding substances that are suitable only to a limited extent for use in column liquid chromatography
- Knowledge regarding the health risks of chemicals
- Participation during an installation of a device or a training by the company KNAUER or an authorized company.

If you do not belong to this or a comparable professional group, you may not perform the work described in this user manual under any circumstances. In this case, please contact your superior.

Personal Safety Equipment for Professional Group

When working with the device, take measures according to lab regulations and wear protective clothing:

- safety glasses with side protection
- protective gloves
- overall

What must be taken into account?

- All safety instructions in the user manual
- The environmental, installation and connection specifications in the user manual
- Observe national and international regulations pertaining to laboratory work!
- Original spare parts, tools, and eluents made or recommended by KNAUER
- Good Laboratory Practice (GLP)
- For the development of methods and validation of devices: Protocol for the Adoption of Analytical Methods in the Clinical Chemistry Laboratory, American Journal of Medical Technology, 44, 1, pages 30-37 (1978)
- Accident prevention regulations published by the accident insurance companies for laboratory work

More safety relevant information is listed in alphabetical order in the following table:

Topic	Explanations
Decontamination	Contamination of devices with toxic, infectious or radioactive substances poses a hazard to all persons during operation, repair, sale, and disposal of a device. All contaminated devices must be properly decontaminated. All materials or fluids used for decontamination must be collected separately and disposed of properly.
Flammability	Organic eluents are highly flammable. Since capillaries can detach from their screw fittings and allow eluent to escape, it is prohibited to have any open flames near the analytical system.
Leaks	Regularly check if any system components are leaking.

Topic	Explanations
Solvent tray	Risk of electrical shock or short circuit if liquids get into the device's interior. For this reason, place all bottles in a solvent tray.
Eluent lines	Install capillaries and hoses so as liquids cannot get into the interior in case of a leak.
Power strip	If several devices are connected to one power strip, always consider the maximum power consumption of each device.
Power cable	Defective power cables are not to be used to connect the device to the mains power.
Self-ignition point	Only use eluents that have a self-ignition point higher than 150 °C under normal ambient conditions.
Power supply	Only connect devices to voltage sources, whose voltage equals the device's voltage.
Toxicity	Organic solvents are toxic above a certain concentration. Ensure that work areas are always well ventilated! Wear protective gloves and safety glasses when working with the device.
UV light	Concentrated UV light can disperse from a detector without a flow cell or from the fiber optic connectors, which leads to irritation of the retina. When the flow cell or the fiber optic connectors are replaced, switch the device off and pull the power plug.

Where is use of the device prohibited?

Never use the system in potentially explosive atmospheres without appropriate protective equipment. For further information, contact the Technical Support of KNAUER (see “Contacting the Technical Support” on page 12).

Take the device out of operation

At any time, take the device completely out of operation by either switching off the power key or by pulling the power plug.

Opening the device

The device may only be opened by the Technical Support of KNAUER (see “Contacting the Technical Support” on page 12).

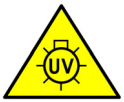
Definition of Personal and Material Damages

Possible dangers related to the device may be divided into personal and material damages in this user manual.

Category	Explanations
DANGER!	Lethal or very serious injuries can occur.
WARNING!	Serious injuries can occur.
CAUTION!	Moderate injuries can occur and device defect can occur.

Symbols and Signs

The following symbols and signs can be found on the device, in the chromatography software or in the user manual:

Symbol	Meaning
	High-voltage hazard
	Electric shock hazard
	Electrostatic discharge hazard, damages to system, device, or components can occur.
	General warning sign, moderate injuries can occur and also damages to system, device, or components.
	UV-light hazard, eye injuries can occur.
CE	A device or system marked with CE fulfills the product specific requirements of European directives. This is confirmed in a Declaration of Conformity.

Unpacking and Setup

Contacting the Technical Support

You have various options to contact the Technical Support:

Phone: +49 30 809727-111

Fax: +49 30 8015010

E-mail: support@knauer.net

You can make your requests in English and German.

Location Requirements

The location for the device must meet the following requirements:

- level surface for device or system
- Protect from heavy ventilation
- Weight: 1.5 kg
- Dimensions: 121 × 129 × 187 mm (Width × Height × Depth)
- Power supply: 24 V DC
- Humidity: below 90 %, non condensing
- Temperature range: 4 – 40 °C, 39.2 – 104 °F

Caution!
Defect of the device due to overheating possible.
- Set up the device in such a way that it is protected against exposure to direct sunlight.
- Keep at least 15 cm clear at the rear and 5–10 cm at each side for air circulation.

Power supply

The device is only suitable for 24 V direct current.

Only the supplied power unit is to be used to connect the device to the mains supply. Replace defective power unit only with original accessories from KNAUER.

Only use power units with a permission for use from your country. In case of queries contact the Technical Support

Note: **Make sure that the power plug on the rear of the device is always accessible, so that the device can be disconnected from the power supply.**

Space Requirements

- Side clearance to other devices:
  - At least 5 cm, if there is another device on one side.
  - At least 10 cm, if there are devices set up on both sides.
- At least 15 cm on the rear panel for the fan.

Unpacking

Store all packing materials. Included packing list should be kept for repeat orders.

Tools

Utility knife

Caution!
Damage to the flow cell caused by carrying the detector incorrectly!
Lift the detector up with your hands grasping the side panels.

Procedure

1. Check for damages caused during transportation. In case you notice any damage, contact the Technical Support and the forwarder company.
2. Set up the delivery so the label is in the correct position. Using the utility knife, cut the adhesive tape. Open the delivery.
3. Remove the foam inserts. Take out the accessories kit and the manual.
4. Open the accessories kit and take out all accessories. Check the scope of delivery. In case any parts are missing, contact the Technical Support.
5. Grip the device at its side panels near the middle and lift it out of the packaging.
6. Remove the foam inserts from the device.
7. Check for damages caused during transportation. In case you notice any damage, contact the Technical Support.
8. Set up the device in its appropriate location.
9. Remove the protective foil and transportation securing device (standard detector only).

Connectors on the Rear Side

All connectors are located on the rear side of the detector.

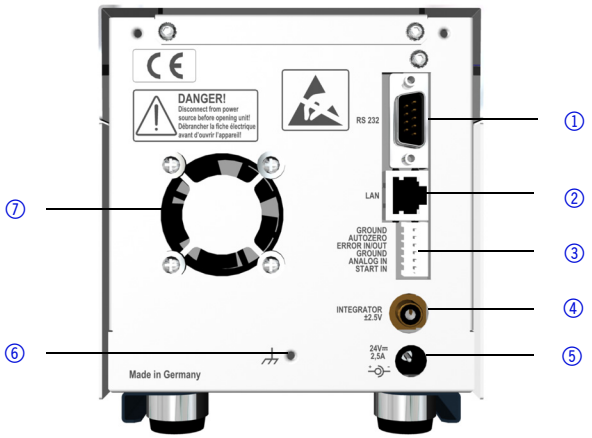


Fig. 3 Detector UVD 2.1S rear view

Legend	
① RS-232 port	④ Integrator Output
② LAN port	⑤ Connection
③ Spring strip	⑥ Ground
	⑦ Fan

External devices like computers, fraction collectors, etc. can be connected in 3 different ways to the detector:

- Connected via the spring strip (remote connector)
- Connected via LAN within a network
- Connected via RS-232

Control via the spring strip

Caution!
Electrostatic discharge can destroy the electronics.
Wear a protective bracelet against electrostatic discharge and ground.

The spring strip is used for remote control. The single ports transport start, control and error signals.

Spring Strip Assignments

Connection	Function
GROUND	Reference point of the voltage at the signal inputs.

Connection	Function
AUTOZERO	A signal (short circuit to GROUND) sets the measuring signal to zero.
ERROR IN/OUT	IN: After receiving a signal (short circuit to GROUND) from an external device, an error message appears and the device stops. OUT: An error signal is active for as long as an error is displayed e.g. the lamp does not start.
GROUND	Reference point for external analog control of the detector.
ANALOG IN	Allows external analog control of the detector when the option ANALOG has been selected in the SETUP menu. The control voltage must be applied against GROUND.
Start IN	After receiving a signal (short circuit to GROUND) from an external device, the device starts. If controlled via software, an electronic trigger is sent via LAN.

Pin Header for Remote Control

To control one device through another, you use the multi-pin connector. To use remote control, you have to connect cables to the terminal strip (everything comes included with delivery). The single ports are used to exchange control signals.

Prerequisites

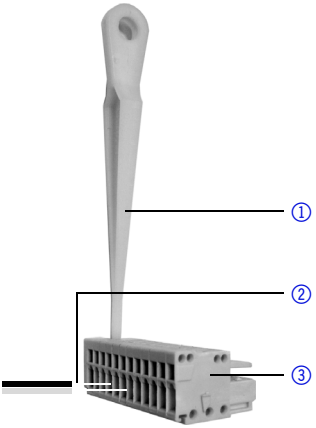
- The device has been turned off.
- The power plug has been pulled.

Tools

Depressor tool

Caution!
Short-circuit hazard.
- Turn off the device before connecting it to the multi-pin connector.
- Pull the power plug.

Caution!
Electrostatic discharge can destroy the electronics.
Wear a protective bracelet against electrostatic discharge and ground.

Process	Figure
1. Place the terminal strip ③ on a suitable surface. 2. Push the depressor tool ① into the opening on the upper side. 3. Continue pushing the depressor tool down and lead the cable ② into the front end of the terminal strip. 4. Remove the depressor tool. 5. Check whether the cables are tightly attached. 6. Plug the terminal strip onto the multi-pin connector.	 Fig. 4 terminal strip

Next steps

Finish the installation and perform the initial startup.

Analog Control

Using the analog port, you can control the wavelength by changing the applied voltage. The analog control must first be selected in the SETUP menu. The control voltage must be applied against GROUND (see “Using the Analog Port” on page 26).

To use the analog port for controlling the detector, you have to set a zero point and enter a scaling value.

- Zero point at 0 V = 000 nm
- Scaling: 100 nm per Volt

If 5 V voltage is applied, the wavelength is 500 nm.

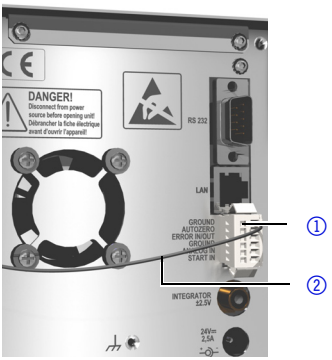
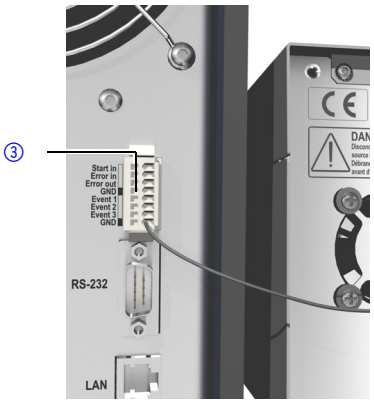
Ground

Voltages, which may influence the measuring result, can be discharged if the device is connected to a grounded device, e. g., a thermostat.

Tools

Depressor tool

Note: When connected to a 24 V power supply, the detector is not grounded.

Process	Figure
1. Remove 5 mm of insulation from the ends of the cable ②. 2. Using the depressor tool, open the port *Ground* ① on the spring strip. 3. Insert the first cable end.	
4. Connect the second cable end to the port *Ground* on the spring strip of a grounded 220 V KNAUER device ③.	

The physical connection is established.

Initial Startup

Note: **Before the detector is ready for use, a flow cell must be installed. Before installing the flow cell, the optical path length in the flow cell can be changed. The optimal path length depends on the type and the quantity of the sample.**

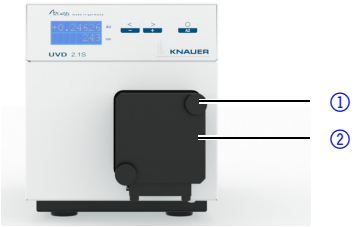
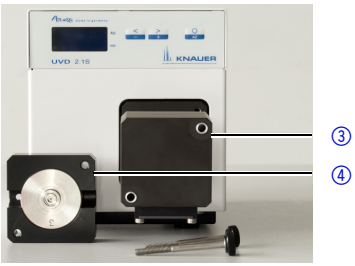
Installing the Flow Cell

The test cell has no connectors for capillaries and must therefore be replaced by a flow cell before first usage.

Prerequisite

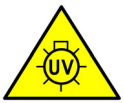
- Detector has been switched off.
- Power plug has been pulled.

Note: **The test cell is used during operation qualifications and must be stored.**

Process	Figure
1. Unscrew the 2 knurled-head screws ①. 2. Pull out the slide ②. 3. Remove the test cell.	 Fig. 5 Removing the slide
4. Insert the flow cell ④ into the slide. 5. Push the slide ③ into the detector. 6. Tighten the knurled-head screws.	 Fig. 6 Assembling the flow cell

Flow cell is assembled. The next step is connecting the capillaries.

Setting the Optical Path Length of a Preparative Flow Cell



WARNING!
Irritation of retina through UV light! Concentrated UV light can leak out from the flow cell or the fiber optic connectors. Switch off the device and pull the power plug.

Depending on type, the path length is factory set to 2 mm, 3 mm, or 10 mm. You can remove the spacers on one or both sides and hence change the path length to 1.25 mm or 0.5 mm.

Prerequisite

Flow cell has been disassembled.

Tools

Allen screwdriver size 3

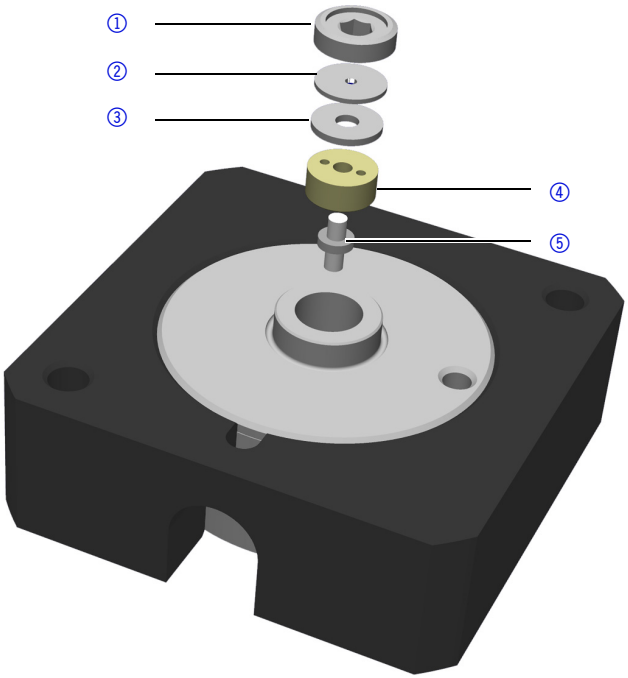


Fig. 7 Preparative flow cell

Legend	
① Threaded ring	③ Spacer
② Cover	④ Seal holder (compression bushing)
	⑤ Light guide with PTFE seal

Procedure

1. Using the allen screwdriver, unscrew and remove the threaded ring ①.
2. Remove the cover ② and spacer ③. Put the spacer aside.
3. Insert the cover.
4. Using the allen screwdriver, tighten the threaded ring.

Enlarging the optical path length

To enlarge the optical path length, put in one or both spacers.

Connecting the Capillaries

Capillaries connect the detector to other devices and lead liquids.

Prerequisite

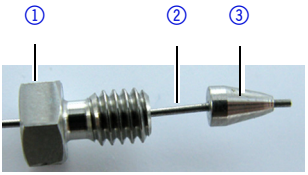
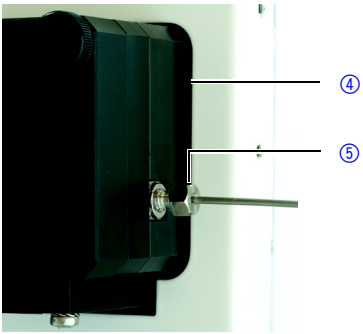
Flow cell has been assembled.

Tools

Torque wrench

Caution!
Damage to the flow cell caused by strongly tightened fittings!
Check the torque of screw fittings:
- 5 Nm for stainless steel fittings
- 0.5 Nm for PEEK fittings

Note: **PEEK fittings withstand a maximum pressure of 400 bar.**

Process	Figure
1. Push the capillary ② through the fitting ①. 2. Push the clamping ring ③ onto capillary.	 Fig. 8 Capillary fitting
3. Manually, screw together the capillary and the flow cell ④. To avoid leaks, tighten the fitting ⑤ with a maximum torque of 5 Nm for stainless steel fittings or 0.5 Nm for PEEK fittings by using the open-end wrench.	 Fig. 9 Capillary and flow cell

Result

Capillaries have been connected and the detector is ready for operation.

Switching the Detector On

Caution!
Possible damage to the device caused by condensed water!
Allow device to acclimate for 3 h, before it is connected to power supply and taken into operation.

Prerequisite

- Installation has been completed.
- Flow cell has been assembled.

Procedure

1. Switch off the power supply.
2. Plug the power supply into the device.
3. Connect the power supply and the plug.
4. Plug in the power supply.
5. Using the power-supply switch, switch on the detector.

Result

The detector starts its self-calibration. The display shows the progress that has been made. When the self-calibration has finished, the status display appears. If the self-calibration fails, switch the detector off and back on.

Practical Tipp! Regularly check the capillaries for leaks.

Operation

The detector can be operated in two ways:

- Control via the buttons on the front panel
- Control with chromatography software

Basic Operation at the Device

The status display shows the values for absorption and wavelength.

Fig. 10 Status display

Legend

① Absorption

② Wavelength

Note: When the deuterium lamp has been turned off or is heating, the absorption values are substituted by OFF or HEAT, respectively.

There are 3 buttons on the detector that can be used for basic operation. Using the buttons, you can monitor the device and change the settings.

Note: **To avoid falsifying measuring values, KNAUER recommends to press the Autozero button before every measurement and after exchanging eluents.**

Figure	Function
Fig. 11 Arrow keys	▪ Keep left arrow key pressed. Scroll using the right arrow key. ▪ Press any of the arrow keys to set values and to change settings.
Fig. 12 Autozero	▪ Initiating an autozero: Absorption is set to 0.000.

Control of the Device

You can control the device using the buttons on the front panel. Handle the buttons in the following manner:

Handling

1. Keep left arrow key pressed. Scroll through the menu using the right arrow key.
2. Let go of left arrow key and, using both arrow keys, set the values.

Menu Structure

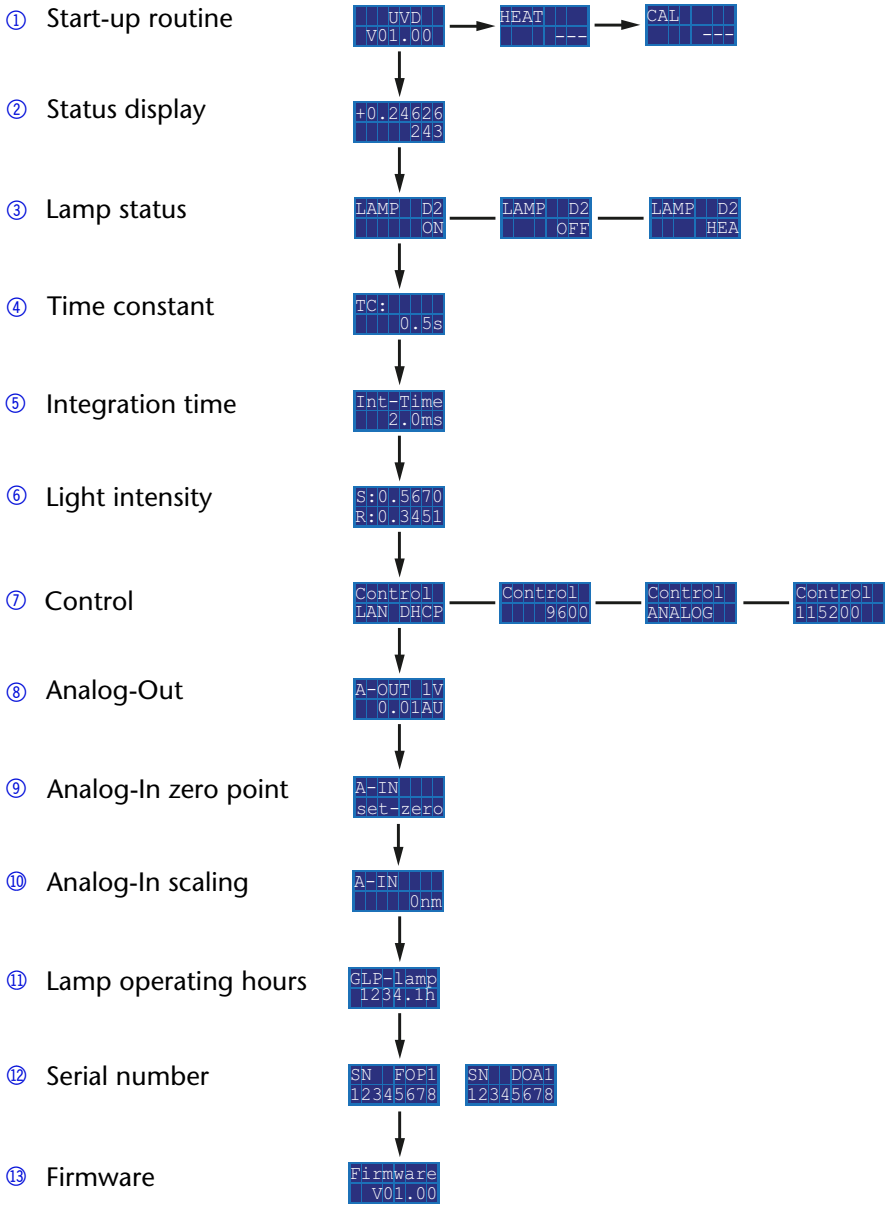


Abb. 13 Menu structure

Control

Choose between analog or digital ports to control the device accordingly.

- LAN DHCP: Control with LAN, IP address is obtained automatically (recommended)
- RS-232 9600: Serial port for cables longer than 2 m
- RS-232 115200: Serial port for cables with up to 2 m length
- ANALOG: Control with applied voltage

Prerequisite

- Where applicable: a physical connection has been established.
- Status display is active.

Process	Figure
1. Keep left arrow key pressed. Press right arrow key until the correct display appears. 2. Let go of left arrow key. 3. Using both arrow keys, choose a port.	 Fig. 14 Display port

When setting is finished, the status display appears.

Activating/Deactivating the Lamp

The status display shows not only absorption and wavelength, but also indicates the status of the lamp.

- HEA: Deuterium lamp is heating.
- OFF: Deuterium lamp is deactivated.
- ON: Deuterium lamp is activated.

Prerequisite

Status display is active.

Process	Figure
1. Keep left arrow key pressed. Press right arrow key until the correct display appears. 2. Let go of left arrow key. 3. Using both arrow keys, activate or deactivate the deuterium lamp.	 Fig. 15 Display Lamp

When setting is finished, the status display appears.

Adjusting the Chromatogram

To get a better representation of the chromatogram, you can either smooth the output signal or adjust the voltage/absorption ratio.

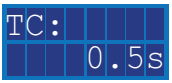
Smoothing output signal

To smooth the output signal, you have to change the values of the time constant.

- 0.00 s, 0.02 s, 0.05 s, 0.1 s, 0.2 s, 0.5 s, 1 s, 2 s

Prerequisite

Status display is active.

Process	Figure
1. Keep left arrow key pressed. Press right arrow key until the correct display appears. 2. Let go of left arrow key. 3. Using both arrow keys, set a value.	 Fig. 16 Display time constant

When setting is finished, the status display appears.

Adjusting V/AU ratio

By assigning different absorption values to a voltage value of 1 V, you can stretch or compress the chromatogram. You can choose the absorption value out of 4 values:

- 0.01 AU
- 0.1 AU
- 1 AU
- 10 AU

Prerequisite

Status display is active.

Process	Figure
1. Keep left arrow key pressed. Press right arrow key until the correct display appears. 2. Let go of left arrow key. 3. Using both arrow keys, set a value.	 Fig. 17 Display Analog Out

When setting is finished, the status display appears.

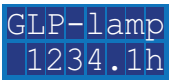
Checking the Deuterium Lamp

Note: The deuterium lamp should be checked regularly. According to Good Laboratory Practice (GLP), a deuterium lamp is to be in operation for no longer than 2000 operating hours.

Displaying Operating Hours

Prerequisite

Status display is active.

Process	Figure
1. Keep left arrow key pressed. Press right arrow key until the correct display appears. 2. Let go of left arrow key.	 Fig. 18 Display operating hours of lamp

The number of operating hours is displayed and afterwards the status display appears.

Next steps

If the deuterium lamp has been operating for approximately 2000 hours consider lamp replacement.

Using the Analog Port

To use the analog port for controlling the detector, you have to set a zero point and enter a scaling value.

Setting the Zero Point

The zero point is predefined by the applied voltage.

Prerequisite

- Device has been connected to GROUND.
- ANALOG port has been selected.

Process	Figure
1. Keep left arrow key pressed. Press right arrow key until the correct display appears. 2. Let go of both arrow keys. 3. Press autozero.	 Fig. 19 Display Analog-In set zero

The applied voltage is set as the zero point and is adjusted to 0 nm wavelength.

Entering a Scaling Value

It is recommended to set 500 nm at an applied voltage of 5 V.

Prerequisite

- Device has been connected to GROUND.
- ANALOG port has been selected.
- Zero point has been set.

Process	Figure
1. Apply voltage. 2. Keep left arrow key pressed. Press right arrow key until the correct display appears. 3. Let go of left arrow key. 4. Using the arrow keys, set a value. Do not press autozero.	 Fig. 20 Display Analog-In Scaling

When setting is finished, the status display appears.

Control with Chromatography Software

The detector can be controlled with e. g. OpenLAB EZChrom edition version A.04.05 or higher, ChromGate version 3.3.2 or higher and ClarityChrom version 3.0.7 or higher.

You will find a detailed description on the chromatography software in the software manual.

There are two advantages to the use of software:

- Continuous operation for triggered measurement is possible.
- System status can be checked in the software.

To be able to control the detector using chromatography software, the computer must be connected to the device either with a RS-232 cable or a LAN cable.

Local Area Network (LAN)

A detector connected to a LAN is recognized by the software and automatically receives an IP address because it is set to Dynamic Host Configuration Protocol (DHCP) at the factory.

Prerequisite

- Device has been connected to LAN.
- Status display is active.

Process	Figure
1. Keep left arrow key pressed. Press right arrow key until the correct display appears. 2. Let go of left arrow key. 3. Using the arrow keys, set to LAN DHCP.	 Fig. 21 Display control

When setting is finished, the status display appears.

Serial interface

The user can choose between two ports:

- 115200: Serial port for cables with up to 2-m length
- 9600: Serial port for cables longer than 2 m

Prerequisite

- Detector is connected to a computer.
- Status display is active.

Process	Figure
1. Keep left arrow key pressed. Press right arrow key until the correct display appears. 2. Let go of left arrow key. 3. Using the arrow key, select the baud rate.	 Fig. 22 Display control

When setting is finished, the status display appears.

Functionality Tests IQ and OQ

Installation Qualification (IQ)

The customer may request the Installation Qualification, which is free of charge. In case of a request, the Technical Support of KNAUER or from a provider authorized by KNAUER performs this functionality test during the installation. The Installation Qualification is a standardized document that comes as part of the delivery and includes the following:

- confirmation of flawless condition at delivery
- check if the delivery is complete

- certification on the functionality of the device

Operation Qualification (OQ)

The Operation Qualification includes an extensive functionality test and must be purchased from the manufacturer. Contact the KNAUER Sales Department to request an offer. The Operation Qualification is a standardized KNAUER document and includes the following:

- definition of customer requirements and acceptance terms
- documentation on device specifications
- device functionality check at installation site

Test Intervals

To make sure that the device operates within the specified range, you should test the device using the Operation Qualification at following intervals:

- Every 3 months: average useful life of more than 5 days/week or 24 hours/day; when operating with buffer solutions or other salt solutions:
- Every 6 months: average useful life of 1 to 5 days/week

Execution

The test can be carried out either by the Technical Support of KNAUER or from a provider authorized by KNAUER.

Maintenance and Care

Proper maintenance of your HPLC device will ensure successful analysis and reproducible results.

Maintenance Contract

The following maintenance work on the device may only be performed by the manufacturer or a company authorized by the manufacturer and is covered by a separate maintenance contract:

- Opening the device
- Removing the hood or the side panels.

Cleaning and Caring for the Device

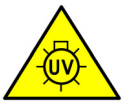
Caution!
Intruding liquids can cause damage to the device.
- Place solvent bottles next to the device or in a solvent tray.
- Moisten the cleaning cloth only slightly.

All smooth surfaces of the device can be cleaned with a mild, commercially available cleaning solution, or with isopropanol.

What Maintenance Tasks can Users Perform on the Device?

Organic solvents are toxic above a certain concentration. Ensure that work areas are always well-ventilated! When performing maintenance tasks on the device, always wear safety glasses with side protection, protective gloves, and an overall.

All wetter components of a device, e. g. flow cells of detectors or pump heads and pressure sensors for pumps, have to be flushed with isopropanol first and water afterwards before being maintained, disassembled or disposed.



WARNING!
Irritation of retina through UV light! Concentrated UV light can leak out from the flow cell or the fiber optic connectors.
Switch off the device and pull the power plug.

Caution!
Performing maintenance tasks on a switched on device can cause damage to the device.
Switch off the device and pull the power plug.

Users may perform the following maintenance tasks themselves:

- Regularly check the operating hours of the deuterium lamp. According to Good Laboratory Practice (GLP), a deuterium lamp is to be in operation for no longer than 2000 operating hours.
- Inspect the flow cell assembly.
- Clean the flow cell.
- Replace the flow cell.
- Replace the fiber optic connectors (Fiber Optics Version only).

Order numbers of the required spare parts can be found in the chapter *Accessories and Spare Parts*.

Cleaning the Flow Cell

Increased baseline noise and reduced sensitivity can be a result of a dirty flow cell. Often it is sufficient to rinse the flow cell to restore optimal sensitivity.

Note: **Dirty lenses or fiber optic connectors could falsify the measurement. Do not touch the lens or the fiber optic connector lends with bare hands. Wear gloves.**

Rinsing the Flow Cell

The following solvents are recommended for flushing:

- HCl
- NaOH
- Ethanol
- Acetone

Tools

Syringe

Caution!
Contamination of the flow cell caused by oil drops!
- Do not use compressed air for drying.

Procedure

1. Fill the syringe with flushing solution.
2. Inject it into the inlet of the flow cell and allow it to act for 5 minutes.
3. Fill the syringe with water and inject again.
4. Remove the flow cell from the detector and use a nitrogen stream to dry it.

Result

Flow cell is clean.

Next steps

Check, if the baseline noise has disappeared.

If the flushing does not have the desired effect, all flow cells can be disassembled to clean the lens.

Cleaning the Lens of an Analytical Flow Cell

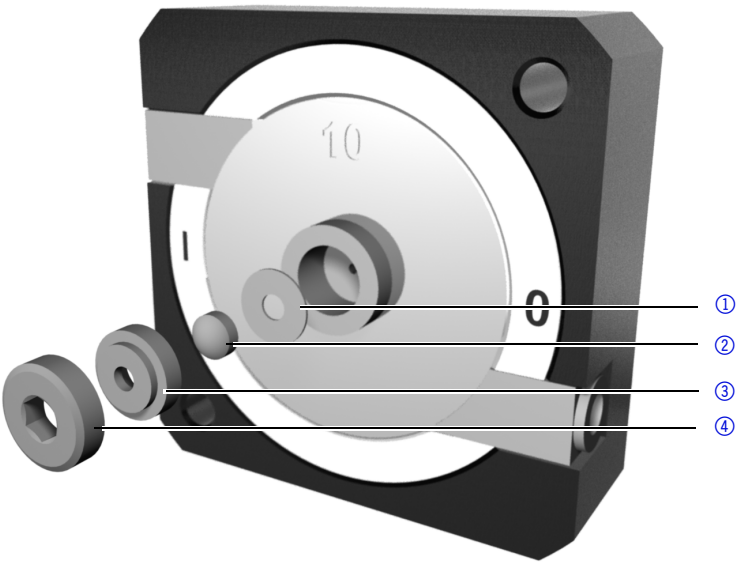


Fig. 23 Analytical flow cell

Legend	
① Seal ring	③ Compression part
② Lens	④ Threaded ring

Prerequisite

- Device has been switched off.
- Power plug has been pulled.
- Flow cell has been removed.

Tools

- Tweezers
- Allen screwdriver, size 3

Procedure

1. Using the allen screwdriver, loosen the threaded ring ④.
2. Using tweezers or by gently tapping on a clean surface, remove the compression part ③.

3. The lens ② is protected by a seal ring ①. This must be renewed every time the lens is disassembled.
4. Remove the lens and clean with a clean, soft cloth or with water in an ultrasonic bath.
5. Afterwards, assemble the flow cell and make sure that the new seal ring does not interrupt the light path.
6. Using the allen screwdriver, tighten the threaded ring.

Result

Flow cell can be assembled.

What to do when...

If the cleaning of the lens does not have the desired effect, the lens has to be replaced.

Cleaning the Light Guide of a Preparative Flow Cell

The preparative flow cells have a rod shaped light guide instead of the concave lens of the analytical cells.

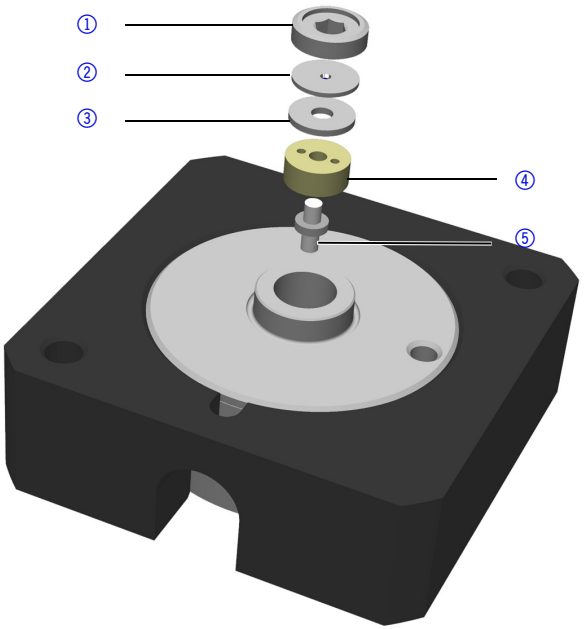


Fig. 24 Preparative flow cell

Legend	
① Threaded ring	③ Spacer
② Cover	④ Compression bushing
	⑤ Light guide with seal ring

Prerequisite

- Device has been switched off.
- Power plug has been pulled.
- Flow cell has been removed.

Tools

- Tweezers
- Allen screwdriver, size 3

Procedure

1. Using the screwdriver, loosen the threaded ring ①.
2. Remove the cover ② and the spacer ③ (not part of all flow cells).
3. Using the tweezers, pull out the compression bushing ④ and the light guide ⑤.
4. Carefully push the light guide out of the holder and strip off the seal. The seal ring needs to be renewed during every cleaning of the fiber optics.
5. Clean the light guide with a clean, soft cloth or with an appropriate solvent in an ultrasonic bath. Make sure that the clean light guide is not touched by fingers.
6. Afterwards, assemble the flow cell and make sure that the new seal ring does not interrupt the light path.
7. Using the screwdriver, tighten the threaded ring ①.

Result

Flow cell can be assembled.

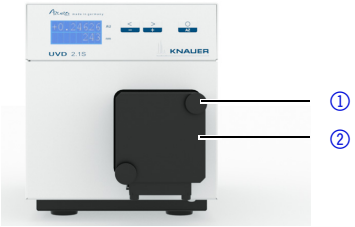
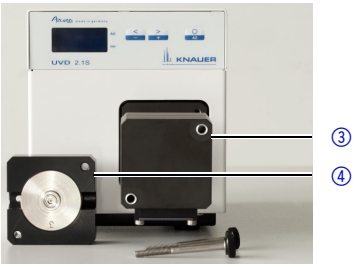
What to do when...

If the cleaning does not have the desired effect, the light guide has to be replaced.

Replacing the Flow Cell

Prerequisite

- Detector has been switched off.
- Power plug has been pulled.
- Capillaries are disconnected.

Process	Figure
1. Unscrew the 2 knurled-head screws ①. 2. Pull out the slide ②. 3. Remove the flow cell.	 Fig. 25 Removing the slide
4. Insert the flow ④ cell into the slide ③. 5. Push the slide into the detector. 6. Tighten the knurled-head screws.	 Fig. 26 Assembling the flow cell

Flow cell is assembled. The next step is connecting the capillaries.

Replacing the Fiber Optics

UV light will cause the fiber optics to become blind with time (solarization), making them no longer suitable for use.

Observe the following regarding the use of fiber optics:

- Do not touch the ends of the fiber optics with your fingers, as this could falsify the measurement.
- Handle the fiber optics with care, avoid impacts or hard actions.
- Move the fiber optics carefully without using pressure or bending it.

Removing the Fiber Optics

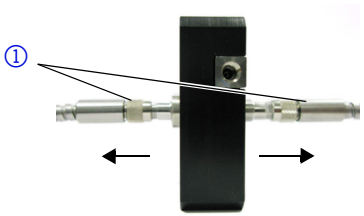
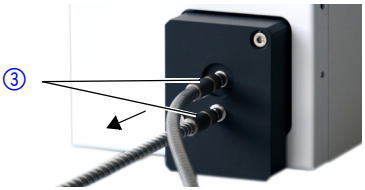
Prerequisites

The device has been switched off.

Tools

Cap fittings for the fiber optics

Note: **Do not touch the ends of the fiber optics with your fingers, as this could falsify the measurement.**

Process	Figure
1. Manually, unscrew the fittings ① of the fiber optics from the flow cell.	 Fig. 27 Fiber optics fittings on the flow cell
2. Seal the fiber optic connectors with caps ② .	Fig. 28 Cap fittings on the fiber optics
3. Manually, unscrew the fiber optics ③ from the detector.	 Fig. 29 Fiber optic connectors on the detector

Technical Data

Detection	Detector type	Small variable single wavelength UV detector. Small variable single wavelength UV detector with fiber optics connectors.
	Detection channels	1
	Light source	Deuterium (D_2) lamp with integrated GLP chip
	Wavelength range	190–500 nm
	Spectral bandwidth	13 nm at H_α line (FWHM)
	Wavelength accuracy	± 3 nm
	Wavelength precision	0.7 nm (ASTM E1657-98)
	Noise	± 2.0 x 10^{-5} AU at 254 nm ± 2.5 x 10^{-5} AU at 254 nm (fiber optics version) (ASTM E1657-98)
	Drift	3.0 x 10^{-4} AU/h at 254 nm 4.0 x 10^{-4} AU/h at 254 nm (fiber optics version) (ASTM E1657-98)
	Linearity	> 2.0 AU at 270 nm (ASTM E1657-98)
	Time constants	0.00/ 0.02/ 0.05/ 0.1/ 0.2/ 0.5/ 1.0/ 2.0 s
	Integration time	Automatic

Communication	Maximum data rate	50 Hz (LAN) 20 Hz (Analog) 10 Hz (RS-232)
	Input	Autozero, Start (IN), Error (either IN or OUT), 0–10 V Analog IN
	Output	Error (either IN or OUT)
	Analog output	1 x ± 2.5 V scalable, 20 bit
	Control	Digital: RS-232; LAN-DHCP; remote connector Analog: wavelength control Manual: front panel
Technical parameters	GLP	Lamp operating hours
	Display	LED
Ambient conditions	Temperature range	4–40 °C, 39.2–104 °F
	Air humidity	Below 90%, non condensing
General	Power supply	External: Input 100 - 240 V, output 24 V DC, 60 W
	Dimensions (Width × Height × Depth)	121 × 129 × 187 mm 121 x 129 x 236 (with flow cell)
	Weight	1.5 kg
	Protection type	IP 20
	Height above sea level	maximum 2000 meters

Accessories and Spare Parts

You will find further information on spare parts and accessories online: www.knauer.net.

Note: **For repeat orders of spare parts use the enclosed packing list. Contact the Technical Support in case there are any questions on spare parts or accessories.**

Devices and Accessories

Name	Order number
AZURA UV Detector UVD 2.1S without flow cell	ADA00
AZURA UV Detector UVD 2.1S Fiber Optics Version without flow cell	ADA05
German user manual English user manual	V6820 V6820A
Accessories kit	FDA
AZURA accessories kit	FZA01
Deuterium lamp	A5193
AZURA tool kit	A1033
Repair kit for analytical flow cells	A1131
Repair kit for preparative flow cells	A1132

Fiber Optic Connectors

Name	Order number
2 × fiber optic connector 750 mm	A0740
1 × fiber optic connector 750 mm	A0742
2 × fiber optic connector, custom made size	A0743
1 × fiber optic connector 400 mm	A0911
Fiber optic coupling	A4530

Available Flow Cells

Most flow cells are also available equipped with fiber optical connectors for the use with the fiber optics version of the detector.

Analytical Flow Cells

Technical data		Order number
Path length	10 mm	A4061XB
Connection	1/16“	
Inner diameter	1.1 mm	
Volume	10 µl	
Material	Stainless steel with heat exchanger	
Max. flow rate	20 ml/min	
Max. pressure	300 bar	

Technical data		Order number
Path length	10 mm	A4061
Connection	1/16“	A4074 (fiber optics version)
Inner diameter	1.1 mm	
Volume	10 µl	
Material	Stainless steel with heat exchanger	
Max. flow rate	20 ml/min	
Max. pressure	300 bar	
Path length	3 mm	A4042
Connection	1/16“	A4044 (fiber optics version)
Inner diameter	1.0 mm	
Volume	2 µl	
Material	Stainless steel	
Max. flow rate	50 ml/min	
Max. pressure	300 bar	
Path length	3 mm	A4045
Connection	1/16“	A4047 (fiber optics version)
Inner diameter	1.0 mm	
Volume	2 µl	
Material	PEEK	
Max. flow rate	50 ml/min	
Max. pressure	30 bar	

Preparative Flow Cells

Technical data		Order number
Path length	0.5 / 1.25 / 2 mm	A4066
Connection	1/8“	A4078 (fiber optics version)
Inner diameter	2.3 mm	
Volume	1.7 / 4.3 / 6.8 µl	
Material	Stainless steel	
Max. flow rate	1000 ml/min	
Max. pressure	200 bar	

Technical data		Order number
Path length	0.5 / 1.25 / 2 mm	A4067
Connection	1/8“	A4079 (fiber optics version)
Inner diameter	2.3 mm	
Volume	1.7 /4.3 / 6.8 µl	
Material	PEEK	
Max. flow rate	1000 ml/min	
Max. pressure	100 bar	
Path length	0.5 / 1.25 / 2 mm	A4068
Connection	1/4“	A4081 (fiber optics version)
Inner diameter	4.0 mm	
Volume	1.7 /4.3 / 6.8 µl	
Material	Stainless steel	
Max. flow rate	10000 ml/min	
Max. pressure	200 bar	
Path length	0.5 / 1.25 / 2 mm	A4068-2
Connection	1/4“	
Inner diameter	4.0 mm	
Volume	1.7/4.3/6.8 µl	
Material	Stainless steel	
Max. flow rate	10000 ml/min	
Max. pressure	200 bar	
Path length	0.5 mm	A4069
Connection	1/16“	A4089 (fiber optics version)
Inner diameter	0.8 mm	
Volume	3 µl	
Material	Stainless steel	
Max. flow rate	250 ml/min	
Max. pressure	200 bar	

Technical data		Order number
Path length	0.5 mm	A4095
Connection	1/16“	A4096 (fiber optics version)
Inner diameter	0.8 mm	
Volume	3 µl	
Material	PEEK	
Max. flow rate	250 ml/min	
Max. pressure	100 bar	

Fiber Optics Preparative Flow Cells

Technical data		Order number
Path length	10 mm	A4154-1
Capillary connection	1/2” with TRI-Clamp	
Material	PEEK and fused silica	
Max. pressure	10 bar	
Path length	7 mm	A4152-1
Capillary connection	3/8” with TRI-Clamp	
Material	PEEK and fused silica	
Max. pressure	150 bar	
Path length	0.5/1.25/2 mm	A4154
Capillary connection	1/2” with TRI-Clamp	
Material	Stainless steel and fused silica	
Max. pressure	80 bar	
Path length	0.5/1.25/2 mm	A4155
Capillary connection	3/4” with TRI-Clamp	
Material	Stainless steel and fused silica	
Max. pressure	80 bar	
Path length	0.5/1.25/2 mm	A4152
Capillary connection	3/8” with TRI-Clamp	
Material	Stainless steel and fused silica	
Max. pressure	150 bar	
Path length	0.5/1.25/2 mm	A4153
Capillary connection	1/4” with TRI-Clamp	
Material	Stainless steel and fused silica	
Max. pressure	80 bar	

Test Cells

Technical data		Order number
Test cell	normal	A4123 A4125(fiber optics version)
Test cell	holmium oxide filter	A4126 A4128 (fiber optics version)
Test cell	filter stray light	A4146 A4148 (fiber optics version)

Disposal

Hand in old devices or disassembled old components at a certified waste facility, where they will be disposed of properly.

AVV Marking in Germany

According to the German "Abfallverzeichnisverordnung" (AVV) (January, 2001), old devices manufactured by KNAUER are marked as waste electrical and electronic equipment: 160214.

WEEE Registration

KNAUER as a company is registered by the WEEE number DE 34642789 in the German "Elektroaltgeräteregister" (EAR). The number belongs to category 8 and 9, which, among others, comprise laboratory equipment.

All distributors and importers are responsible for the disposal of old devices, as defined by the WEEE directive. End-users can send their old devices manufactured by KNAUER back to the distributor, the importer, or the company free of charge, but would be charged for the disposal.

Solvents and Other Operating Materials

All solvents and other operating materials must be collected separately and disposed of properly.

All wetted components of a device, e. g. flow cells of detectors or pump heads and pressure sensors for pumps, have to be flushed first with isopropanol and then with water before being maintained, disassembled or disposed.

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Declaration of Conformity

Producer	KNAUER Wissenschaftliche Geräte GmbH Hegauer Weg 38 14163 Berlin, Deutschland
Model/Type Reference	Detector UVD 2.1S Product no. EDA00, EDA05
	The product complies with the following standards:
Machinery	Machinery Directive 2006/42/EC IEC 60799:1998
EMC	EMC Directive 2004/108/EC IEC 61000-3-2:2009 IEC 61326-1 :2006
Disposal	RoHS Directive 2011/65/EU WEEE Directive 2012/19/EU
Safety	Low Voltage Directive 2006/95/EC IEC 61010-1:2011

CE The product was tested with a typical configuration. The mark of conformity has been applied to the rear panel.

Date Berlin, 01.10.2014

A. Knauer

Alexanda Knauer (CEO and owner)

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Translation of the original German edition of this manual, version 2.3
Last manual update: 2015-07-20
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